

REMARKS

Claims 1-15 and 27-29 are pending in the application with claim 8 amended herein.

Claims 1-5, 9-11, 15, 27, and 28 stand rejected under 35 U.S.C. 102(e) as being anticipated by Fukuzumi. Applicant requests reconsideration.

Claim 1 sets forth a capacitor fabrication method that includes, among other features, forming a first capacitor electrode containing TiN over undoped, rugged polysilicon, forming a capacitor dielectric layer over the first electrode, and forming a second capacitor electrode over the dielectric layer. The first electrode has an innermost surface area per unit area and an outermost surface area per unit area that are both greater than an outer surface area per unit area of the substrate. The innermost surface of the first electrode includes a surface of the first electrode that is firstly formed over the substrate. The outermost surface of the first electrode includes a surface of the first electrode that is lastly formed over the substrate. Page 3 of the Office Action alleges that Fukuzumi discloses each and every limitation of claim 1. Applicant traverses.

The Office Action alleges that Figs. 30-34 of Fukuzumi describe polysilicon film 51 as disclosing the claimed undoped, rugged polysilicon. Also, the Office Action alleges that reaction barrier layer 55 discloses the claimed first capacitor electrode containing TiN. Thorough review of Fukuzumi including, but not limited to, column 14, line 36 to column 16, line 14 discussing the subject matter of Figs. 30-34 reveals that Fukuzumi fails to support the Office's allegations. Instead, Fukuzumi directly contradicts the Office's allegations. First, no support exists for the Office's proposition that polysilicon film 51 is undoped. Fukuzumi expressly requires polysilicon film 51 to

be conductive and, thus, it cannot be undoped. Second, Fukuzumi fails to disclose or suggest the surface area limitations of the first electrode set forth in claim 1.

Regarding doping of polysilicon film 51, column 14, lines 62-65 and column 15, lines 17-21 require that polysilicon film 51 forms part of the lower electrode of a capacitor. In this manner, polysilicon film 51 provides electrical connection for capacitor charge between metal film 52 of the capacitor electrode and contact plug 3. Contact plug 3 is, in turn, electrically connected to a memory cell transistor as discussed in the Abstract and throughout Fukuzumi. The required function of polysilicon film 51 as part of a capacitor electrode precludes such material from including undoped rugged polysilicon, as set forth in claim 1. Applicant's assertion is further supported by at least page 17, lines 1-6 of the present specification discussing the limitations of using undoped polysilicon. Page 5 of the Office Action apparently considers it inherent in Fukuzumi that polysilicon film 51 may be undoped. However, such a composition would frustrate the intended purpose of polysilicon film 51 to function as an electrical connection between metal film 52 and contact plug 3.

In relying upon the theory of inherency, the Office must provide a basis in fact and/or technical reasoning to support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the relied upon reference. Applicant asserts that it is inconceivable for polysilicon film 51 inherently to disclose undoped rugged polysilicon since such allegedly inherent characteristic cannot be considered to flow from the teachings of Fukuzumi. Instead, Fukuzumi precludes such an inherent teaching as frustrating the intended purpose of polysilicon film 51. At least for such reason, Fukuzumi fails to disclose each and every limitation of claim 1.

In addition, with regard to the first capacitor electrode surface area, column 15, lines 17-21 expressly state that the lower electrode of Fukuzumi includes both polysilicon film 51 and metal film 52. Accordingly, the surface of the lower electrode that is firstly formed constitutes the surface of polysilicon film 51 that contacts insulating interlayer 10, insulating interlayer 2, and contact plug 3. The lastly formed surface of the Fukuzumi lower electrode constitutes the surface of metal film 52 that contacts high-dielectric film 53. Notably, the lastly formed surface of the Fukuzumi lower electrode exhibits a much higher surface area per unit area in comparison to the firstly formed surface of the lower electrode. Also, the surface area per unit area of the firstly formed, or innermost, surface of the Fukuzumi lower electrode is identical to the surface area per unit area of insulating interlayer 10, insulating interlayer 2, and contact plug 3 that polysilicon film 51 contacts. Accordingly, Fukuzumi does not disclose the lower electrode's innermost surface area per unit area as being greater than the substrate's surface area per unit area.

Notably, claim 1 refers to the surface area "per unit area" and not to total surface area. That is, surface area comparisons are made on a "per unit area" basis irrespective of the total area of a particular surface. Such a convention for comparing surface areas is well known to those of ordinary skill and widely used for surface area comparisons. The Fukuzumi surface areas may be contrasted with the claim 1 surface areas setting forth that both the innermost and outermost surface area per unit area of the first electrode is greater than the outer surface area per unit area of the substrate. At least for such additional reason, Fukuzumi fails to disclose or suggest each and every limitation of claim 1. Claims 2-5, 9, and 27 depend from claim 1 and are not

anticipated at least for such reason as well as for the additional limitations of such claims not disclosed.

Page 4 of the Office Action alleges that Fukuzumi discloses each and every limitation of claim 10. Applicant traverses. Claim 10 sets forth a capacitor fabrication method that includes, among other features, forming a layer of polysilicon over the sides and bottom of an opening in an insulative layer, removing the polysilicon layer from over the bottom of the opening, and converting at least some of the polysilicon layer to undoped HSG. The method includes forming a first capacitor electrode on and in contact with the HSG, forming a capacitor dielectric layer on the first electrode, and forming a second capacitor electrode over the dielectric layer.

Referring to Figs. 18-22 of Fukuzumi, the Office Action alleges that lower electrode 24 discloses the first capacitor electrode set forth in claim 10. However, Applicant notes that the claimed first capacitor electrode is formed on and in contact with the HSG. Thorough review of Figs. 18-22 and column 11, line 33 to column 12, line 43 of Fukuzumi discussing the subject matter of Figs. 18-22 reveals that Fukuzumi fails to support the Office's allegation. Column 11, lines 61-64 expressly require that polysilicon film 23 be converted to silicon oxide film 23A. Fukuzumi only discloses lower electrode 24 being formed on silicon oxide film 23A. Fukuzumi does not disclose, as alleged by the Office, forming lower electrode 24 on polysilicon film 23. At least for such reason, Applicant asserts that Fukuzumi fails to disclose each and every limitation of claim 10. Claims 11 and 15 depend from claim 10 and are not anticipated at least for such reason as well as for the additional limitations of such claims not disclosed.

In the event that the Office becomes inclined to allege that claim 10 is obvious over Fukuzumi based upon some yet-to-be-identified modification of Fukuzumi's

disclosure, Applicant asserts that claim 10 remains patentable over Fukuzumi. The test for establishing an implicit teaching, motivation, or suggestion for the combination of two statements within a single prior art reference is to view what such statements would have suggested to those of ordinary skill. In re Kotzab, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). The two statements must be considered in the context of the entire reference's teaching and cannot be viewed in the abstract. Id. A rejection cannot be predicated on the mere identification in the reference of individual components of claimed limitations. Id. Instead, particular findings must be made as to the reason a person of skill would, with no knowledge of the claimed invention, select the components of the two statements for combination in the manner claimed. Id.

Applicant asserts that no teaching, motivation, or suggestion exists or is alleged by the Office to exist somehow to combine the features of Figs. 22 and 20 to instead form lower electrode 24 on polysilicon film 23. Further, Applicant asserts that forming lower electrode 24 on polysilicon film 23 instead of silicon oxide film 23A would frustrate the intended purpose set forth in Fukuzumi of subsequently removing silicon oxide films 23A to obtain structural advantages described by Fukuzumi for the Fig. 24 structure. Column 12, lines 5-10 of Fukuzumi describe a method for removing silicon oxide films 23A, but Fukuzumi does not disclose or suggest a corresponding method for removing polysilicon film 23.

Claim 28 sets forth a capacitor fabrication method that includes, among other features, forming a layer of polysilicon over the sides and bottom of an opening in an insulative layer, removing the polysilicon formed over the bottom of the opening, and converting at least some of the polysilicon layer to undoped HSG. The method includes forming a continuous first capacitor electrode having an innermost surface on and in

contact with the HSG. As may be appreciated from the discussion above regarding the deficiencies of Fukuzumi as applied to claim 10, Fukuzumi fails to disclose each and every limitation of claim 28.

At least for the reasons established herein, Applicant asserts that Fukuzumi does not anticipate claims 1-5, 9-11, 15, 27, and 28 and requests allowance of such claims in the next Office Action.

Claim 8 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Sneh in view of Raaijmakers. Claim 8 is amended herein to depend from claim 1 the subject matter of which is discussed above. Sneh in view of Raaijmakers fails to remedy the deficiencies of Fukuzumi established herein. Applicant asserts that claim 8 is patentable at least for such reason as well as for the additional limitations of such claim not disclosed or suggested.

Claims 6, 7, 12, 13, and 29 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuzumi in view of Sneh and in further view of Raaijmakers. Applicant requests reconsideration.

Claims 6 and 7 depend from claim 1 and claim 12 depends from claim 10, the subject matter of claims 1 and 10 being discussed above. Review of Sneh and Raaijmakers reveals that such references fail to remedy the deficiencies of Fukuzumi as applied to claims 1 and 10 discussed above. At least for such reason, the cited combination of references fails to disclose or suggest every limitation of claims 1 and 10. Claims 6, 7, and 12 are patentable at least for such reason as well as for the additional limitations of such claims not disclosed or suggested.

Claim 13 sets forth a capacitor fabrication method that includes, among other features, forming a layer of polysilicon over the sides and bottom of an opening in an

insulative layer, removing the polysilicon layer from over the bottom of the opening, and converting at least some of the polysilicon layer to HSG. The method includes forming a chemisorption product of first and second precursor layers included in a first capacitor electrode on and in contact with the HSG. As may be appreciated from the discussion above regarding the deficiencies of Fukuzumi as applied to claim 10, Fukuzumi also fails to disclose or suggest every limitation of claim 13. Neither Sneh nor Raaijmakers considered alone or in combination remedy the deficiencies of Fukuzumi established herein. At least for such reason, claim 13 is patentable over the cited combination.


Claim 29 sets forth a capacitor fabrication method that includes, among other features, forming a layer of polysilicon over the sides and bottom of an opening in an insulative layer, removing the polysilicon from over the bottom of the opening, converting at least some of the polysilicon layer to HSG. The method includes forming a chemisorption product of first and second precursor layers included in a continuous first capacitor electrode having an innermost surface on and in contact with the HSG. As may be appreciated from the discussion above regarding the deficiencies of Fukuzumi as applied to claim 10, Fukuzumi fails to disclose or suggest every limitation of claim 29. Neither Sneh nor Raaijmakers considered alone or in combination remedy the deficiencies of Fukuzumi established herein. At least for such reason, claim 29 is patentable over the cited combination.

At least for the reasons established herein, claims 6, 7, 12, 13, and 29 are patentable over Fukuzumi in view of Sneh and further in view of Raaijmakers and Applicant requests allowance of such claims in the next Office Action.

Applicant herein establishes adequate reasons supporting patentability of claims 1-15 and 27-29 and requests allowance of all such pending claims in the next Office Action.

Respectfully submitted,

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